What is Claimed Is:

1. A hard, abrasion and corrosion-resistant material useful as an ultra-thin protective overcoat layer for a magnetic or magneto-optical (MO) recording medium, which material comprises hydrogenated carbon (C:H) formed by a process comprising simultaneous sputter and plasma-enhanced chemical vapor (PECVD) deposition of said hydrogenated carbon (C:H), wherein the amount of carbon atoms in said C:H material derived from the PECVD component of said process is less than about 50 at. %.

2. The material according to claim 1, wherein the amount of carbon atoms in said C:H material derived from the PECVD component of said process is at least about 30 at. %.

3. The material according to claim 1, wherein the position of the Raman G-band of the C:H material is about 1553 cm^{-1}.

4. The material according to claim 1, wherein the film resistance of the C:H material is as high as about 85 k Ω.

5. A magnetic or MO recording medium comprising a protective overcoat layer formed of the C:H material according to claim 1.

6. The medium according to claim 5, wherein the thickness of said protective overcoat layer is not greater than about 30 Å.

7. A method of forming a layer of a hard, abrasion, and corrosion-resistant hydrogenated carbon (C:H) material on a surface of a substrate, which method comprises the steps of:

(a) providing a vacuum chamber including a carbon sputtering target in the interior space thereof;

(b) providing a substrate in said interior space of said chamber, such that a surface of said substrate is in facing relation to said sputtering target;

(c) supplying said interior space of said vacuum chamber with at least one hydrocarbon gas and at least one inert gas at separately controllable flow rates and applying a sufficient negative potential to said carbon sputtering target to generate a plasma in said interior space to deposit a layer of hard, abrasion and corrosion-resistant C:H material on said substrate surface by a process comprising simultaneous sputtering of said carbon sputtering target and plasma enhanced chemical vapor deposition (PECVD) of carbon and hydrogen from said at least one hydrocarbon gas, wherein:

step (c) includes separately controlling the flow rates of each of said hydrocarbon and inert gases to said vacuum chamber such that the amount of carbon atoms in said layer of C:H which are contributed by said PECVD component of said process is less than about 50 at. %.

8. The method according to claim 7, wherein:

step (c) includes separately controlling the flow rates of each of said hydrocarbon and inert gases to said vacuum chamber such that the amount of carbon atoms in said layer of C:H which are derived from said PECVD component of said process is at least about 30 at. %.

9. The method according to claim 7, wherein:

step (c) includes supplying said interior space of said vacuum chamber with at least one hydrocarbon gas of formula C_xH_y, where x = an integer from 1 to 5 and y = an integer from 5 to 10 and at least one inert gas selected from the group consisting of He, Ne, Ar, Kr, and Xe.

10. The method according to claim 9, wherein:

step (c) includes supplying said interior space of said vacuum chamber with at least one of acetylene (C_2H_2) and ethylene (C_2H_4) as said at least one hydrocarbon gas and Ar as said at least one inert gas.

11. The method according to claim 7, wherein:

step (a) comprises providing an elongated, cylindrical carbon sputtering target rotatable about its axis of elongation; and

step (c) further comprises rotating said cylindrical carbon target about said axis of elongation.

12. The method according to claim 7, wherein:

step (b) further comprises applying a bias voltage within the range from 0 to about - 150 V to said substrate during step (c).

13. The method according to claim 7, wherein:

step (b) comprises providing a magnetic or magneto-optical (MO) recording medium as said substrate, said surface thereof comprising the exposed surface of an uppermost layer of a stack of layers comprising said medium; and

step (c) comprises forming a protective overcoat layer of said hard, abrasion and corrosion-resistant C:H on said exposed surface of said uppermost layer of said medium.

14. The method according to claim 13, wherein:

step (c) comprises forming said protective overcoat layer to a thickness not greater than about 30 Å.

15. The method according to claim 13, wherein:

step (b) comprises providing a disk-shaped substrate.

16. A recording medium, comprising:

(a) a substrate;

(b) a stack of thin film layers on said substrate; and

(c) a protective overcoat layer on an uppermost layer of said stack of thin film layers, wherein:

said protective overcoat layer comprises a hard, abrasion and corrosion-resistant material comprising hydrogenated carbon (C:H) formed by a process comprising simultaneous sputter and plasma-enhanced chemical vapor (PECVD) deposition of said hydrogenated carbon (C:H) material, wherein the amount of carbon atoms in said C:H material contributed by the PECVD component of said process is less than about 50 at. %.

17. The medium as in claim 16, wherein the amount of carbon atoms in said C:H material contributed by the PECVD component of said process is at least about 30 at. %.

18. The medium as in claim 16, wherein the position of the Raman G-band of the C:H material of said protective overcoat layer is about 1553 cm^{-1} and the film resistance of said C:H material of said protective overcoat layer is as high as about 85 k Ω.

19. The medium as in claim 16, wherein:

said stack (b) of thin film layers comprises a stack of layers for a magnetic or magneto-optical (MO) recording medium.

20. The medium as in claim 19, wherein:

said substrate (a) is disk-shaped.

21. The medium as in claim 19, wherein:

said stack (b) of thin film layers comprises a stack of layers for a magnetic recording medium; and

said protective overcoat layer (c) is not greater than about 30 Å thick.

22. The medium as in claim 21, wherein:

said stack (b) of thin film layers includes at least one ferromagnetic layer comprising Co.

23. An apparatus for performing simultaneous sputter and plasma-enhanced chemical vapor (PECVD) deposition of a layer of a hard, abrasion and corrosion-resistant, hydrogenated carbon (C:H) material on a surface of a substrate, comprising:

(a) a vacuum chamber defining an interior space;

(b) a carbon sputtering target in said interior space of said vacuum chamber, said carbon target being in the form of an elongated cylinder rotatable about its axis of elongation;

(c) substrate mounting means for mounting a substrate in said interior space of said vacuum chamber, such that a major surface of said substrate is in parallel, facing relation to said elongated cylinder-shaped sputtering target; and

(d) gas supply means for supplying said interior space of said vacuum chamber with at least one hydrocarbon gas and at least one inert sputtering gas at separately controllable flow rates.

24. The apparatus as in claim 23, wherein:

substrate mounting means (c) comprises means for mounting a disk-shaped substrate such that a major surface thereof is in parallel, facing relation to said cylindrical sputtering target.

25. The apparatus as in claim 23, further comprising:

(e) bias voltage applying means for applying a bias voltage to said substrate within the range from 0 to about - 150 V.

26. A magnetic recording medium, comprising:

(a) at least one ferromagnetic thin film layer containing Co; and

(b) means for protecting said at least one Co-containing ferromagnetic thin film layer from corrosion under high temperature, high humidity environments.